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ABSTRACT

Case studies of six gifted productive youth (9-18 years old) were conducted to search for the special environmental conditions and personality characteristics that precede and accompany such productivity. Interviews were held with the students, their parents, and their teachers. Students were also requested to keep a journal to record their feelings about themselves and important others, and information about the origin and development of their creative ideas. Based on observations in the case studies, implications for teachers are noted regarding enhancing productivity. Among implications are that teachers should encourage risk taking and learning to feel "OK" about being wrong; teachers cam model the use of analogies in analyzing and understanding situations; and teachers should realize the scope of positive impact they can have on student creativity and productivity. Among suggestions noted for parents are to listen to their children, provide them quiet and privacy, and promote interactions with professionals in fields of interest. (CL)

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The Secret Ingredients in Gifted Children's Productivity

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Abstract

Case studies of six gifted productive youth, four boys and two girls, were developed in order to search for the special environmental conditions and personality characteristics that precede and accompany such productivity. In-depth interviews with the youth, ages 9 to 18, their parents and their teachers were conducted. Students were also requested to keep a journal which would record their feelings about themselves and important others, and information about the origin and development of their creative ideas. Identified indicators and precursors of productive behavior were then used to develop implications for teachers and parents in their efforts to foster productivity in gifted youth.

The Secret Ingredients in Gifted Children's Productivity

Robert S. Albert states that, "The transformation of early giftedness into adult eminence is one of the most enthralling and secretive processes of human development" (1978, p.202). Albert further states that, "Perhaps the most urgent question regarding our gifted youth is, will they produce? If so, when? If not, why not? At any point in their development, the answer, I believe, is simply, have they?" (1978, p. 202) Albert asserts that early productivity is the best behavioral index of potential eminence. But how does this productivity originate?

Autobiographical accounts and studies of eminent people indicate that the drive to achieve and the persistence to self confidently accomplish integrated goals are traits which distinguish the most successful individuals in terms of achievement in adult life. This cluster of traits, considered an essential component of giftedness by Renzulli (1978) is termed task commitment. The ways in which task commitment may be exhibited in gifted youth is further described by Haensly, Shiver and Fulbright (1980). For example, some of our gifted youth are unusually productive. They are self-motivated, able to follow through on in-depth projects from start to finish, and able to communicate effectively their results to others. These young gifted people evidence at an early age the drive and persistence necessary for accomplishing their goals.

In order to nurture productivity in other gifted youth we must attempt to understand how high productivity develops, not merely

assess the value of products or exclaim over productivity. Thus, it was the objective of the study reported here to search for the "secret" ingredients which may be necessary for this kind of productivity to occur, and to suggest implications to teachers and parents for fostering productive behavior in gifted youth.

Method

Six case studies were conducted. Four of the gifted students who were invited to participate in this case study research, three boys and a girl, were ten- and eleven-year old fourth graders, selected on the basis of their general performance in the independent studies that were a part of their school's gifted program. Their performance on these independent studies had been observed to be intense and extensive, exhibiting both breadth and depth in the topics they selected. They had developed final products that were well prepared and completed enthusiastically with little prompting from either their classroom teacher or the Gifted/Talented Resource Coordinator. These students had been observed working on their independent studies in both their third and fourth grade years.

A fifth subject, a female, and a junior in high school when we first met, had achieved extensive honors and awards in numerous science fairs. The sixth subject, a male college sophomore,was working as a computer specialist.

The purpose of the study and the types of information that were being sought were explained to each subject. They were then given a journal in which they were asked to record verbally or graphically their ideas, their feelings about themselves and important others in their life, and especially any information about how, when and where

they got ideas. Each was asked to attempt to recall these creative episodes in as much detail as possible, giving special attention to what happened before and after the idea was initiated. Approximately a month later, they were interviewed individually in their homes by the group of three researchers. The interviews were unstructured in format but covered the topics of background information (age, family statistics, etc.), descriptions of how their ideas arise (with whom, where, when and in what form), creative episodes they had experienced, their self-image and their plans for the future. The information compiled on each subject was, therefore, an integration of external observations by researchers, teachers and parents, and the subject's self-report and self-analysis.

Case studies have returned to the legitimate arena of research, especially through the prominent and successful work of such individuals as Donald Graves (1975) in the area of language arts. They provide an opportunity to take a close holistic look at individual children and can contribute much needed insight regarding the elements and processes that these children use as they function and think successfully. The insight gained regarding idea formation and development in these children can help teachers and parents of the gifted understand the needs of these children, know when and how to push them and, more importantly, know when and how to refrain.

Case Study Vignettes

CRAIG

Craig, an eleven year old, was intensely interested in the topic of this study. He did not consider himself "just a subject"--he wanted to participate fully in the analysis of how ideas arise in

productive individuals. He was an avid journal keeper and requested that we provide him feedback on what he wrote and said that helped us most in our research. He even suggested the pseudonym of 'Craig' to be used as we described his case.

Craig, one of two children, with a thirteen year old sister, was born in New Jersey where he lived for three years. He then lived in Virginia for five years before coming to his present location in Texas. His family recently moved to a new house on a large acreage in the country where he appeared to be very involved with nature and his surroundings. His hobbies include exploring, catching insects, and collecting rocks, shells and the like. However, he emphasized that making things and solving problems were his favorite activities. He said "When I hear about things that have happened, I think about what needs doing."

A very active boy, Craig is involved in scouting and many sports, including basketball, baseball, soccer and award winning track. His ability to reflect about his body's athletic capabilities is illustrated by the following journal entry:

> Today at a track meet I was running the mile and I was on my fourth lap (you only run 4 times around). I knew my muscles would give out on me and they did. (It felt like they did but they didn't.) Then I felt myself floating as if I were on a cloud. Then I found myself finishing the race even though I thought I had stopped with one half a lap to go. I was breathing hard after the race even though I wasn't so tired. My feet and legs were as tired as could be and I had a hard time walking normally. I still felt like I was not

walking. I like the feeling of floating.

Craig also loves to read almost any kind of book, but primarily adventures and science fiction. He described reading as, "learning about exciting things." How his creativity is developed through his reading is fascinatingly shown in this journal excerpt:

> When I was reading a book called, "The Voyage of the Dawn Treader," by C. S. Lewis there was a part where Prince Caspian (that's the captain of the ship) said, "Down to the Oars!" I thought a lot about people down at the oars rowing and how fast it would go. Then I asked myself how could you make a one man boat and make it still go almost as fast as if thirty people were rowing. While I was thinking I was reading the book even though I knew nothing about what I was reading. The words that I am looking at give me some ideas that the words have nothing to do with. And finally after I have invented this boat I find that I have read about two pages and don't know a thing about what they said.

In Craig's interview with us he spoke with extreme clarity, never seeming to find it difficult to express himself. He spoke quietly, intensely, with few traces of self-consciousness, yet was modest and matter of fact about his accomplishments, ideas and feelings. Craig was unusually advanced in his analysis and description of idea production and of his own creative episodes. He reflected in a highly formal operational manner about his own thinking. For example, on the subject of how his ideas come to him, Craig wrote in his journal:

> When I'm getting an idea I don't do anything except sit and stare at something. Sometimes I stare at something and draw a picture with my finger on my desk. I'm not looking at it

> and I can't even see it out of the corner of my eye, but the picture I am drawing on my desk is being drawn very, very neatly in my mind.

His first journal entry elaborated this "picture" motif:

> A picture forms in my mind. It is all laid out. It is in many details. I focus eyes in my mind on the picture. And I do what the picture is, like, telling me. I get very excited and proud of myself for thinking that up. I hurry and try to get it down on paper before the picture goes out of my mind in a flash of light. It's real weird.

Craig described what he does when he doesn't have time to act on an idea right away, "If I write it, even if I lose the paper I can remember it." Speaking with much creative self-assurance, Craig continued,

> Once I get an idea and I finish with it, I still keep it, but I put it to the back of my mind. When I draw my ideas, I usually think about how they're going to work and then I don't have to think any more about that. And then new ideas come. I've never been without a new idea.

In pondering over when his ideas come to him, Craig wrote:

> I usually get ideas when I don't have anything to do and my mind is like white paper. I'm thinking over what I have to do. I'm just glancing over it in my mind and the first thing I think about on that subject is the answer. I think, how could I have missed it when I was thinking about it before? I don't know, so I think, as my Mom says, "Your brain was unplugged." (And sometimes it is.)

He also stated:

> I get ideas usually when I'm alone. I don't usually get ideas when people are around because all the voices bother me. When I think I'm usually in a quiet mood. I usually rest my head on my hands and don't move my legs or anything. I also like to lie down and stare at the ceiling. I use the ceiling as a background for my ideas. After I get the idea I get more energy and quickly write it down or draw my idea.

In trying to pinpoint where his ideas come from, Craig writes:

> This is a question that I've never found an answer to. I've always wondered what the voice inside me that was talking to me was. It's not a very clear voice but it is enough for your brain to know what it is saying. Right now I am putting the words in order by what this voice tells me to. I still can't distinguish what tone it's in.

The source of idea production or development for Craig seems to involve important people in his life. While it appears that Craig learns from almost everybody and everything, some of the outstandingly important persons involved in Craig's life of ideas include his mother, his Gifted/Talented Resource Coordinator, and special teachers. Regarding his mother, Craig volunteered, "She talks to me a lot, about books and things; she often says something and that triggers my ideas." About his Gifted/Talented Coordinator, he said, "If you hadn't come along, well—I wouldn't be thinking about all of these ideas!" He described a special fourth grade teacher who, ". . .makes me want to learn more. Getting in a hard group in her class is a reward for doing what I want to do and I keep on trying because it's fun!" Craig also referred to his father, whom he queries

about the feasibility of his new ideas, and to his peers at home and school.

Craig described a number of creative episodes, and the following excerpt from his journal illustrates how his ideas are built piece by piece into a culminating solution:

> When I was working on my laser report I thought that the laser was just formed in the ruby rod and shot. Then I read a book that said there was a mirror that only reflected 70% of the light shown against it. I wondered about that for a minute and then decided to put it in the back of my mind and let my brain work on it. Then I was reading another book that said that another mirror reflected 98%. When I read that I started thinking about the two sentences more. I was perplexed. Every time I stopped to rest after writing a paragraph or two, the sentences came into my mind. When I was reading the encyclopedia I read something that told me about atoms and molecules bouncing back and forth. Then at that moment it came to be like puzzle pieces that the laser light bounces back and forth against the mirrors and the light that came out of the one mirror was the laser beam. I was happy as a Quizelwink! (A Quizelwink is a happy thing that lives on the planet called Quink!)

When Craig gets really stuck on a problem, he says,

> I get real mad—it bugs me—I lie down to sleep and when you go to sleep your mind has complete control of your whole body. You're thinking without knowing it at all. Then in the morning, I have an idea--first one that may not work,

then one that really works.

When asked about how long it takes to decide on the one idea that really works, Craig replied, "Oh about five minutes to get an idea, then five, or maybe seven minutes to see if it will work."

Craig seemed to know where to go to find answers or information to formulate answers, but how he analyzes the process of information retrieval is fascinating. He writes:

> Sometimes I have to use my knowledge to get my answer. It takes some time to get the answer because the knowledge I have to put together is in the different parts of my brain. It's like putting a puzzle together in the brain except to really know if you have the idea correct you have to build it and see how it works. It's just the same with a puzzle piece, you can't tell if it's right until you try it.

Craig's self image appeared to be one of capability, assuredness about his ability to process ideas, along with some wonder about himself. "Sometimes I wonder why I'm sometimes not that smart and the people who usually aren't as smart as me, are. I'm still wondering."

Craig's last journal entry further enlightens us regarding his creative process:

> Sometimes in my mind I see a balloon. When I pop the balloon there is a creative bird. For example, I am writing a story, and am trying to figure out how the story could go. So I stop and think. While I am thinking in my mind I am throwing darts at the balloon. Then POP! I hit the balloon! Then the creative bird sings to me how she thinks it should be. And that is how I got the idea.

JULIE

Seventeen year old Julie is an energetic combination of joyous adolescence and ageless wisdom. Julie moved to Texas when she was three and a half years old after living for a few months each in Nevada, California, and New Mexico and for a year in the Phillipines. She has one older sister.

Julie's expressiveness and exuberance can be seen in her facial expressions, her laughter, her sketches and her journal writing. She seemed to enjoy sharing her thoughts with us orally and in writing. Although she commented in her journal, "I hate talking to a piece of compressed cellulose!", it was full of scientific project ideas, sketches of animals and people, philosophical discourses, and some thoughts about her thinking processes. She wrote, "I'm doing this for science; my thoughts are usually reserved for friends, and then only a little at a time. No one will ever know who I am including myself."

Julie's first love is science although literature follows at a close second. During the interview Julie was asked when she first became interested in science:

> I think I was always interested in science and not knowing that I was interested. I was always interested and curious about things... I always liked bugs and I always liked gopher holes. I was always interested in how and why about nature and everything, and I used to like to go to the creek and find little specimens, which actually were pets at that time, of crawdads, minnows, turtles, and things like that. Gradually, I found out that's science.

During her early schooling Julie complained that teachers made science boring. However, her ninth grade biology teacher finally stimulated

her interest and since that time she has been entering science fairs and winning awards for her sophisticated projects.

Other hobbies for Julie include jogging, painting, and writing. Her writing, however, is only for her own consumption--she does not like others to read what she writes. Her favorite authors include Solzhenitsyn, Joyce and Faulkner and she lists Whitman, Dickenson and Emerson as her favorite poets. Her description of herself as a naturalist and a humanist stems directly from her literary interests. In fact, the literature Julie reads has had a great influence on her life and her philosophy. She often cites Whitman or uses examples from the lives or works of Joyce or Dickenson to explain her own ideas.

Julie frequently applies her literary knowledge to her science interest. She says, "I can apply how to analyze a poem with how to analyze a problem in science." It is interesting to see how she integrates her science vocabulary with her philosophical discourses in her journal. She writes, "Truth is polycyclic and can't be found, only attempted and this is what makes life what it is." She often compares scientists and literary people in the way in which each group searches for truth: "Science outgrows its old ideas; literature remains, but science outgrows its old because they've been proven wrong; literature's haven't." On the subject of truth Julie states, Truth has become out of fashion; it's tacky. Give us your truths, we'll accept them; give us opposites, we'll take them too--as long as they are nice and neat, they'll fit in. Truth is drawn by popular demand. Truth--we'll never find it, but if we stop looking, we're the ones that die.

People have also had a major impact on Julie. She calls her ninth grade biology teacher her "mentor". She describes this woman by saying,

> She was so alive, loved what she did, cared about her students and she showed that. She has made the most difference in my life. My mentor made me want to learn, made me more curious, showed me avenues of how to find the things that I was curious about.

On the subject of mentors, Julie comments, "Mentors are great, one of the most necessary things I've run into." Fortunately for Julie, her mentor's husband is an English professor who shares Julie's thirst for literature. He has also become somewhat of a mentor to her. She spends a lot of time with this family, and she gives them credit for having changed her life totally.

Julie also talked about her friends. Those her age she can "have fun with", but she says, "With friends my age I will never talk about Faulkner; I tried it once." She mentioned that she does have some older friends--graduate students and others--with whom she can discuss her philosophy of life.

As is evident from her journal and our interviews with her, Julie has a constant and rapid flow of ideas going through her mind. She often complained about this overflow of ideas saying, "I'm sick of trying to write down what I'm thinking when my brain won't let me catch up to what it's saying." However, she does seem able to catch some of her ideas, and unlike others who may be able to immediately translate their ideas into words, Julie talks about "feeling" ideas. "I know when I have an idea that's good because it just feels right." She describes the process:

> When I think of an idea it doesn't stick on paper very well. Fragments are put down that act as a catalyst when read to reactivate the thinking process. I can never write down clearly what I'm thinking because it's not really a thought but more of a feeling that comes on and moves and jumps around too fast to catch and remember.

Sometimes when she gets an idea, Julie sees images and colors, but everything is moving too fast. Fortunately she is often able to get enough language down on paper to remember many of her ideas; however, she finds it frustrating to not know how to accomplish some of her advanced ideas.

Julie does not have one place where she goes to get ideas. She talked about going to a nearby park or creek to think, or to the library to sit and read. However, she has one requirement when she wants to think--to be alone.

> If I'm not left alone, I will go out of my gourd. I have to be alone, at least an hour a day. If you're not alone, how are you supposed to think? You can't talk to yourself when you are with people because you're talking to them. You have to be alone to understand what you're saying.

Ideas do, however, sometimes come from talking to others, especially her mentors or the judges at Science Fairs. Julie uses Science Fairs to verify her scientific ideas. She states,

> I really don't care if my ideas are known or not, but through this I can find out if my ideas are right--if what I've proven is right. I can find new avenues and people who will understand and explain other ways of doing my project

and others' ideas. It gives you more people to go through. It's important to Julie to see if her scientific ideas are right, and she often confers with scientists to discuss her project plans to be sure her methods are not out-of-date or faulty.

When Julie gets stuck on a problem she sometimes goes to the library or talks to others to gather more information. However, most problems she says she can solve herself and she does it by jogging or going to sleep. These are relaxed periods of time for her when nothing else is on her mind. She described how she sometimes wakes up at three o'clock in the morning saying, "Aha!"

Julie stated that she's not a logical person except when she has to be. However, after listening to her describe the process she goes through when trying to prove something in her science projects, it was agreed that she has an analytical mind and is quite logical:

> I start with my idea, and then I start with ways of how to prove it, how I can expand on it, how this project can be disproven, how I can change the project to be more important--expand the question or narrow the question--whichever the case may be. Then I look for ways that I can find if it's been proven before--go and look in the library. Then, after I've done all that I will write the procedure. Then I do it, and then I decide if I've proven what I wanted to and if I haven't, I decide what the heck I did prove.

When we asked Julie what her strengths are she talked about her stubbornness--about her constant questioning of what people say--asking, "Why?". She also described her uniqueness as a strength:

> I'm my own self; if I read a book, I'm a little of it; if I see a leaf, I'm a little bit of it. I'm a little bit of

everything I've ever done or everyone I've ever met who made an impression on me. I'm a mixture--a mutt- of something.

When asked if there was anything she would change about herself, she replied, "Nothing important I'd like to change. I'd like to know more about everything."

In talking about the future, Julie told us she wants a career in biomedical research. She remarked,

> I want to be doing what I want to do--because I'm working for those ideas--I don't want to get stuck in a job . . . I want to be in a job where I can think . . . I want to be myself . . . I want to be able to do the things I want to do.

MARK

Mark, a nineteen year old sophomore in college, is a very personable, well-spoken young man. He has one younger sister and has lived in Texas all of his life. He describes himself as being very intense although a sense of humor is often evident. He enjoys all kinds of music and plays the drums, but in his words, "I live and breathe computers. They are my hobby and my work." He is already considered to be an expert by many people who are in the field of microcomputers.

Before Mark was in eighth grade, he had taught himself to program in BASIC. From this time on, he worked in various computer stores where he gained experience in the repair and service of computers. Currently, he is employed by a medium-sized microcomputer business where he is responsible for all the computer equipment. He designs software and is in charge of a large project for which he coordinates

the efforts of a programmer and an outside consultant. Mark addresses large audiences regarding various aspects of microcomputers and is reported to be an outstanding teacher who targets his delivery to the needs and background of his audience. He has published one article and has others in preparation.

When Mark was asked how he thinks and gets ideas, he stated that he thinks largely in pictures--he doodles in his mind for ideas. He compares his problem solving processes to geometric proofs. He begins with a "given" and the final result that he wants. He then relies on his knowledge of computer programming and his intellectual ability to travel from the given to the result. He proceeds by first gathering information in his head. He then flow charts in his head and lastly transfers his mental work to paper. He states that he thinks best when he is under the pressure of time or when he is competing with himself--trying to improve over his past performance. He states, "When the going gets rough, that's when I get going." He also tries to get adequate rest, eight to ten hours of sleep per night.

When he arrives at a real problem point in programming--a "snag" as he calls it--he sticks with it as long as he can. If he cannot solve the problem, he will leave it and jog or drive, take a shower or sleep. He is then able to come back and approach it from a new angle.

When asked what he might change about himself, if he had the power to change anything, he said he would have played football in high school for the ladies. Otherwise he would change nothing.

Mark is highly introspective and self-analytical. Although he has four friends he considers to be close to him--all are male and ten to fifteen years older than he is--he states that there is not one

person with whom he can really communicate on an intellectual and/or emotional level. Regarding computer successes or problems, there is no one who can legitimately pat him on the back, and there is no one who can help him solve his snags because he has not yet met anyone who is as knowledgeable as he is in the area of microcomputers. Although his parents, some teachers and others have given him support and encouragement, he is largely self-taught and is troubled because, as he states, "A person runs his best race when someone is running slightly ahead, challenging him on." Mentorship is an obvious need for Mark but he has not yet found such a relationship.

Mark yearns for praise and keeps "performing" for more, often by doing volunteer computer service for others to the point of excess. When asked if he feels many of his highest expectations may be self-imposed, he gave it some thought and nodded. Although he gets "down" periods from time to time, he states that so far, "I've been able to pull myself up by the belt loops and get myself in gear, and I will continue to do just that."

Mark says that in the future he wants to apply his abilities to the "real world". He sees a strong differentiation between theory and practice. In fact, he has been quite disillusioned with his college curriculum. He first enrolled in the computer science department which dealt mostly with computer theory, not opportunities for application of tools and knowledge. He transferred to the Business Analysis Department which is more relevant to his future business dealings but is not serving his needs in computer education. He states, "I've been out in the real world, and have learned that the academic world and the real world are just not in sync."

In summing up his goals regarding computers and his ability, Mark writes in his journal:

> I will work to accomplish the impossible like magicians of the olden days. I have even amazed myself at what I have sometimes accomplished. Never yet and never to come will I give up while my reputation is to make magic with computers and achieve the impossible.

SARAH

Sarah is a fourth grade student excelling in her school's gifted and talented program. She is immediately likeable--very congenial, with an excellent sense of humor and a contagious laugh. She is highly descriptive in conversation and utilizes a broad vocabulary. She has many interests including swimming, racquet ball, computers and music. Sarah has lived in New York, Massachusetts and Texas, and has one younger brother in the first grade.

Sarah stated that she enjoys thinking of new ideas. She explained that her ideas come to her in pictures rather than words and she sometimes draws her ideas on paper. Idea production occurs for Sarah in new places. She stated that it is hard to think of a new idea in her room--she's seen everything in it over and over. Ideas come to her after movies, or on field trips, or while engaging in an enjoyable activity such as swimming. She mentioned a recent idea she had for developing towels that would never get wet. Regarding people who inspire her, Sarah told us that her teachers are the people who have most encouraged her to be all that she can be.

When Sarah gets a new idea, she only goes to her own mind to discuss it--not to anyone else. She explained that she cannot refine an idea very well if she shares it with someone else. If she does share it, very often the other person will attempt to refine it and she then feels that the idea is no longer hers. She prefers a trial and error method of experimentation and discovery rather than prelearning outcomes from others. She also stated that she can't really figure out something unless she can touch it, take it apart, and really look at it. When Sarah has developed her idea fully, she sometimes does and sometimes does not share it.

Sarah aspires to be a scientist in her future. Specifically, she wishes to study under Dr. Carl Sagan at Cornell. She worried that he might not be teaching when she is ready for college. However, she answered, "No." to our question, "Is he a hero to you?" She stated that she had learned a lot from him and that he had inspired her. His show, "Cosmos", informed her about the many things that are yet unknown. She hopes to learn much on her own and then combine his information with her own to build ideas to solve some of the scientific mysteries he described. She stated that she might attempt to design a spacecraft that would be capable of leaving the galaxy someday, and then added with her contagious giggle, that that did not mean that she would want to be the one to go out of the galaxy!

When asked how she felt about herself, Sarah said she wouldn't change a thing. The only point of frustration she has at this time in her life is that her mind travels to ideas which she is not yet able to develop fully and test. She looks forward to the day, as she gets older, when she will have a greater store of information and the resources and the freedom to explore the ever increasing scientific

pathways of her mind.

"J"

Ten year old J spent a great deal of time telling us about his favorite topic, the fantasy game of Dungeons and Dragons, which he has played for several months. In his description of the game, his verbal narrative was extremely detailed, using sentences which were grammatically well expressed with a wealth of advanced vocabulary. He appeared to be completely engrossed in the topic and never seemed hesitant or "wondering" about our interest in the topic. His command of all the intricacies of the game and the rules, and the specific vocabulary were extensive (e.g., medusae, nauseate, conjurer, hobgoblins). The game, he stated, fits in with his interest in medieval times, on which he had done two independent studies in school.

J was born in Columbia, Missouri, moved when he was three to North Carolina and then to Texas at the age of six. J has a mother and father who apparently devote much time to his intellectual and physical development, providing a variety of experiences and materials for his interest and use. He has one younger brother. His present interests appear to center on Dungeons and Dragons, board games and a variety of sports. A typical summer day for him included swimming, track, a short TV stint, making models, and much time at his Dungeon and Dragons tasks. He is a soccer player and is proud of the trophy he received for it. He also mentioned ribbons he was awarded for pictures he drew for the Houston Rodeo Art Show. Regarding the models he works on, he stated that he likes to make them according to his own ideas; he said, "I don't want to listen to the instructions."

Regarding his interest in reading, J told us that he has already completed a couple of readings of Tolkien's trilogy, "Lord of the Rings" and "The Hobbit". In talking about writing, J stated, "It's easy for me to write down my ideas," and he showed us notebooks filled with his own Dungeons and Dragons material. Yet, his journal was extremely sparse, and introspection did not seem to be a highly compelling interest to him. J's journal was limited to a brief page on "How I Get Ideas," a sketch, a poem, and a list of his completed dungeons for Dungeons and Dragons. The latter, very interestingly, included a three-level evaluation of each completed dungeon and a key, complete with symbols.

School to J was described as "just work" with the independent studies seeming more like a hobby. J gets ideas from everything. He stated,

> I can just about look at anything and get an idea, like that chair over there could be a mutation chair for my dungeon. I keep my eyes open, look at things and think of what they might be.

J continued,

> I get ideas from books and movies. I talk with my Dad who suggests something that makes me laugh, and then this gives me an idea for something. I get ideas when I talk with my friend.

Regarding idea development J stated,

> Once I have something in my head it just stays there until I write it down. I get a vision—I think of how it would look or see what would happen if I did such and such. This is

> exciting! I try them out in my mind before I put them down on paper--then I write--I don't like to erase! I think in pictures.

The creative episodes of J, at the moment, appear to be tied up in Dungeons and Dragons. However, when we posed an imaginary problem, he described his idea production process in this way:

> First I get a picture in my mind. Then I break the task into steps and think of questions that would get better answers. Some kids just go ahead without planning steps.

J emphasized the need to plan ahead. For example, in response to one of our interview questions, he said,

> I don't necessarily have more ideas than other kids--some plan even better clubhouses than I could think of--they may have ideas but they soon forget them. But I write them down and I carry them through.

J's comments about himself in relation to other children were also insightful and interesting:

> I see some of these kids going into fifth grade and they don't know half as much as I know, because I just read a book and get all of my information out of that--such as biographies of famous people. They go out and have fun and games--I read a book for pleasure. They do independent studies on something that doesn't really benefit them--just for pleasure. I do independent studies that teach me something. I could educate myself instead of going to school.

In response to the question of, "Do you see yourself as different from others your age?", J replied,

> Some kids don't have any athletic ability; some are better swimmers, higher jumpers, faster runners, better kickers than I, but I do everything, and I do some things pretty well.

When asked how others would describe him, he said,

> I think that they think I'm smart, they trust me, they pick me for everything--I think maybe they should pick someone else sometimes. I'm good at sports. I like being good at a lot of things. I wish the day was longer so I could fit more things into it. I wouldn't want to change anything about myself. I feel I don't know everything about everything, but that's okay with me.

Finally, J said that he thinks he can do anything he puts his mind to!

AARON

Aaron, eleven years old, is the second of three children. He has such a broad range of interests that it was difficult to state a topic in which he had absolutely no interest! Aaron's hobbies include collecting stamps and foreign coins; participating in sports; reading science fiction, fantasy and biographies; inventing his own games for Dungeons and Dragons; playing piano; making up stories which he only occasionally writes down; and traveling; (he has had the opportunity to go to Europe the past two summers). Our attention to Aaron originated through the independent studies he conducted at school on diverse topics such as the human body, microscopic life, medieval times and historical facts about Europe. He describes these independent studies as the, "best thing I've done in school." He stated that he not only learns from them, but has a lot of fun, and if

he could choose how to work in school, he would want to do more independently.

Aaron was quiet but quite articulate. Although he seemed somewhat shy during our interview, one of his teachers reported that he has an amazing ability to verbalize what he is thinking and doing, and, in giving presentations, he is able to help younger children understand his projects through his use of analogies and examples. Aaron stated that he feels very comfortable giving presentations on his independent projects.

Aaron is people oriented; he has a number of friends his age with whom he enjoys playing. Other important people in his life include his mother and father who provide him with a strong source of encouragement, his Gifted/Talented Coordinator, and his third grade teacher. He says that third grade was a turning point in his life because his teacher not only encouraged and reinforced his ideas, but she also challenged him by being flexible in adapting to his special needs.

Ideas, according to Aaron, come when "I see something better than I know it usually and try to find out why... Then I try to think of ways to improve the bad things in the world, such as pollution." His journal entries indicate that ideas also come from the books he reads and the things he sees. He likes to allow his mind to wander and often asks "what if" questions. For example, while visiting a castle in Heidelberg Aaron wondered, "What if some old hermit was living in these walls behind yet unopened doors?" Another of his thoughts expressed in his journal was, "What if all the people alive today got to start over with a new world, would they avoid the mistakes they

made?"

After getting an idea, Aaron begins plans to carry it out. He says, "Once attached to an idea, I don't want to give it up." He will first tell his mother and father about the idea in order to get a realistic appraisal of whether or not it can be done. They will help him obtain any parts he may need and will be very encouraging. If he cannot carry if out physically, he often draws blueprints for it. However, if there is any indication that it can be done, he'll try. To prepare to work on the idea he will conduct research through books and will work on the plan in his head. He said that he thinks in both words and pictures. If Aaron gets stuck on a problem, he may go to his mother or father, but often he "takes breaks"—goes out and swims, plays kick ball or reads. While doing these things he often finds it difficult to let go of the problem.

The fact that Aaron makes good grades in school, has a number of close friends, knows a lot and can carry out independent projects pleases him. Although he says that there are things he doesn't like about himself, he also stated that, "I don't think I'd change anything."

Aaron doesn't know what he'll do in the future because of his varied interests. He says he may get into the study of animals, medical research, chemistry or engineering, and write stories in his spare time.

IMPLICATIONS

Based on the observations made in these case studies, the following suggestions to teachers for enhancing the productivity of gifted students have been derived.

1. Teachers must realize the tremendous positive impact they can have on the students' creative/productive development. Four of the subjects of this study cited one or more teachers who they felt contributed largely to their productive behavior--who let them explore while learning and helped them to believe in themselves and their abilities.

2. Teachers can enhance opportunities for the development of creativity by assuring the students that being different in thoughts and actions is not only okay but is, in fact, terrific! Teachers can help students feel comfortable with themselves while in the classroom environment. For example, remind them that if they all thought alike, where would we get new ideas, inventions, new books, etc? All of the subjects in this study felt comfortable with their unique gifts and original thoughts.

3. Teachers should encourage the students to take risks while learning and to feel "okay" about being wrong. Gifted students are often so self-critical that they require reassurance that being wrong is an adventure in their learning. When students are right all the time, the need to adjust their learning material should be recognized.

4. Teachers can model the use of analogies to show students an effective way to analyze and understand situations. Teach them, by modeling, to rearrange situations into terms they can relate to easily. The subjects of this study frequently used analogies in discussion and idea development.

5. Teachers should take time to teach and discuss the process of thinking. Through our interaction with these students and many others as young as six years of age, it is apparent that their idea production reflects the four stages of the Wallas' (1926) creative

process: preparation, incubation, illumination and verification. Understanding the creative process will enable students to develop more tolerance and patience when in the process of idea production. When Craig was told about Wallas's stages, he was highly interested. He exclaimed, "I love thinking about thinking!" He said that it made him so much more aware of how his mind works and that he notices more about how and what he is thinking.

6. Teachers can enable students to conduct much of their own learning through independent research and study. This provides students with opportunities to focus on their interests and to learn in their own style. It also affords the student an opportunity to learn much more than a teacher is capable of providing in the classroom due to time and other restraints. This learning is not always measurable, but the teacher should remember that some of the greatest things one learns cannot be assessed on a test! All of the subjects cited independent studies as providing some of their best learning. J said that independent study was more like a hobby than school work. Many students also enjoy teaching what they have learned to others in their class, thereby gaining experience in communication.

7. For high school and even junior high students, mentorship can be provided to enable the gifted to learn from a professional in the field. Julie received much inspiration and direction from her mentor whom she described in depth, saying that her mentor was the person who motivated her to enter and win science fairs. Mark has not yet had a mentor and greatly desires one. A mentorship can alter the course of a person's life by demonstrating productivity in action, offering the student practical experience and insight into his or her

field of interest. Younger children can also benefit from short term interviews or limited interaction with professionals in their field of interest, perhaps when they are engaged in independent study.

8. Teachers should spend time observing their students. Their behavior will provide the teacher with many hints regarding interests and preferred style(s) of learning. The teacher might schedule individual conferences with the students in an effort to learn more about the student's interests and thoughts.

9. Journals should be provided for students who wish to keep a record of ideas or thoughts. Some of our subjects made excellent use of their journals as a personal record of ideas and as a vehicle for expression of feelings. The teacher might share excerpts from a personal journal or read excerpts of early journals of people who have achieved eminence, to give the students ideas for ways to utilize their journals. The teacher should remember that pictures are a very acceptable journal entry--the student does not need to record entries in words only.

Suggestions to parents for enhancing productivity in their gifted children include the following:

1. Take time to listen to your children. Welcome their willingness to communicate. Craig, for example, shares many of his ideas with his mother and desires her input.

2. Ensure that your children have the quiet time and privacy they require. Remember that daydreaming and inactivity may be indicators that the child is in the incubation process of idea development. Privacy may be the necessary environment for the incubation process to occur.

3. Provide varied opportunities for learning (private lessons in talent areas, travel, museums, etc.). However, follow the lead of the child and be sure not to overschedule.

4. Capitalize on opportunities to interact with professionals in the field of interest. These interactions may provide great stimulation and motivation which can encourage the child to think more seriously about a future career, a new idea, or ways to increase productivity in the present situation.

5. Let your children know that they are loved unconditionally. Gifted/productive children sometimes gets confused, thinking they are loved for performance only. Consequently, when they perceive that they have has failed in performance (even a small failure) these children can feel alone, unloved, and very defeated.

Reference Note

The information presented in this paper was reported at the 1982 Annual Convention of the National Association for Gifted Children in New Orleans, LA. and included in the Convention Abstracts.

Roeder, Cindy, Haensly, Patricia A., & Edlind, Elaine P. (1982). The productive gifted child: The "secret" ingredients. National Association for Gifted Children Convention Abstracts, Twenty-ninth Annual Convention.

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